

Algebra I Item Sampler (Updated April 2011)

Purpose

The purpose of this Item Sampler is to provide teachers and students with examples of the types of questions that will appear on the *ISTEP+*: Algebra I Graduation Examination. The types of questions include multiple-choice, gridded response, and constructed response. *Note: When filling in response grids, any answer that can be written as a mixed number must be entered as an improper fraction or decimal. For example, if the answer to a problem is $2\frac{1}{2}$, then the response must be entered as 2.5 or $\frac{5}{2}$.*

For schools testing online, there is an online practice test to be given prior to the actual test. The purpose of the online practice test is to help familiarize students with the online functionalities and item types. Schools testing online are encouraged to use this item sampler, as well.

Teachers are encouraged to use this Item Sampler to:

- Familiarize themselves and their students with the types of items that will be part of the Algebra I End-of-Course Assessment.
- Gather information about students' knowledge of the standards and use that information to drive instruction.
- Assist in creating other assessments and activities.

On a related note, schools may apply to have access to Acuity Algebra. Talk to your principal and/or test coordinator for more information about Acuity Algebra. You may also call our office at 317-232-9050.

Additionally, High Achiever (<http://dualmus.doe.state.in.us/hiach/>) is a Web-Based tool that teachers can use to create assessments and exercises based on Indiana's Algebra I Standards.

Depth of Knowledge (DOK)

Every item on the Algebra I test is assigned a "depth of knowledge" level by a committee of Indiana educators consisting of teachers and math specialists. The assignment of Depth of Knowledge (DOK) levels ensures the items on each test represent a range with regard to the cognitive demand required from students as they respond to test questions. The No Child Left Behind Act requires different levels of complexity within assessments.

See the Depth of Knowledge PowerPoint for a general overview at <http://www.doe.in.gov/core40eca/>.

Reference Sheet

The Algebra I Reference Sheet may be used on both sessions of the Algebra I test. Teachers are encouraged to use the reference sheet throughout the year to familiarize students with the structure of and information contained in the reference sheet. The Reference Sheet can be accessed here http://www.doe.in.gov/assessment/eca_resources.html.

Calculator Policy

Students are allowed to use a calculator on one session of the Algebra I ECA. Students are **not** allowed to use a calculator on the other session unless specified in the student's IEP or Section 504 plan. Students should use calculators with which they are familiar. Sharing of calculators is not allowed.

The memory and stored programs and applications in each personal calculator should be cleared before and after testing. Students should be told prior to the test day to store all software and data they wish to save on a computer or calculator not being used for the test.

The **prohibited** calculator list below is not exhaustive. Changes in technology occur at a rapid pace; thus, it is very difficult to list all of the calculators not permissible. In general, calculators with a QWERTY keyboard, a computer algebra system (CAS), and talking devices are NOT allowed. Be sure to ask your mathematics department chair if you are unsure whether a particular calculator is allowed.

Examples of Calculator Models NOT Allowed

- Models with QWERTY keypads, such as: TI-89, TI-92, TI-Voyage, HP 95
- Models with a computer algebra system (CAS) or dynamic algebra system, such as: TI-Nspire + CAS, HP 49G, Casio ClassPad 300
- Models with infrared devices
- Models with paper tapes
- Models that require an electrical outlet
- Models that make noise or “talk”
- Pocket organizers, handheld computers, laptop computers, electronic writing pads or pen-input devices, such as:
 - Palm Pilot, HP Jornada, Casio Cassiopeia, Handspring Visor, Audiovox Maestro, Compaq iPAQ, Sony CLIE PEG, Sharp Wizard, Sharp Zaurus, NEC Mobile Pro
- Cellular phones or other wireless communication devices, such as:
 - iPod touch

Solving Linear Equations and Inequalities

1. Solve: $5x + 12 = x - 4$

- A. -4
- B. $-\frac{8}{3}$
- C. 2
- D. $\frac{4}{3}$

2. Solve $2(2 - x) \leq -3x - 2$ for x .

- A. $x \leq -6$
- B. $x \leq -3$
- C. $x \leq 2$
- D. $x \geq 6$

3. Solve $5x - 10y = -40$ for y .

- A. $y = -2x - 4$
- B. $y = -\frac{1}{2}x + 4$
- C. $y = \frac{1}{2}x + 4$
- D. $y = 2x + 4$

4. Solve: $\frac{2x+3}{4} = \frac{x}{4}$

- A. $x = -3$
- B. $x = -1$
- C. $x = 1$
- D. $x = 3$

5. The formula $A = \frac{1}{2}bh$ represents the area of a triangle where A represents the area, b is the base of the triangle and h is the height of the triangle.

Solve this formula for b .

- A. $b = 2A - h$
- B. $b = A - \frac{1}{2}h$
- C. $b = \frac{A}{2h}$
- D. $b = \frac{2A}{h}$

6. Megan bought 7 charms for \$31.50. Each charm costs the same amount of money.

Write an inequality that can be used to find the maximum amount of charms (c) Megan can buy with \$75.

Answer _____

What is the maximum amount of charms Megan can buy with \$75?

Answer _____

7. Solve $-2x - 1 = \frac{3x + 5}{2}$ for x .

Enter your answer in the response grid.

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8	8	8	8	8	8	8	8	8	8
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8. Solve: $x + 4.25 = 3.5x - 1.5x - 0.75$

Enter your answer in the response grid.

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6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9

9. Solve the inequality below for x .

$$\frac{3}{4}x + 2 \leq 3x - 1$$

- A. $x \leq \frac{4}{3}$
- B. $x \leq \frac{4}{15}$
- C. $x \geq \frac{4}{5}$
- D. $x \geq \frac{4}{3}$

10. The equation below was solved incorrectly. Study the work below.

$$5x + 5 = -3(x - 1)$$

Step 1: $5x + 5 = -3x + 3$

Step 2: $2x = -2$

Step 3: $x = -1$

Describe the mistake in the work shown above.

What is the solution to the equation $5x + 5 = -3(x - 1)$?

Answer _____

11. Tony works at a bike store. Tony earns \$300 every week plus \$15 for every bike that he sells.

Write an inequality that can be used to determine the number of bikes (b) Tony must sell in one week if he wants to earn a minimum of \$500 for that week.

Answer_____

What is the minimum number of bikes Tony must sell in one week to earn a weekly salary of \$500?

Answer_____

12. Alex sells T-shirts. It costs Alex \$6.50 to buy each T-shirt. Alex also pays \$150 each month to rent equipment to add print to the T-shirts.

Alex sells each T-shirt for \$12.

Write an inequality that can be used to determine the number of T-shirts (T) Alex must sell each month in order to make a profit for the month. (*Assume that Alex sells each T-shirt he buys.*)

Answer_____

What is the minimum number of T-shirts Alex must sell in order to make a profit in a given month? (*Assume that Alex sells each T-shirt he buys.*)

Answer_____

13. Solve: $-9 \leq -2x + 3 \leq 1$

- A. $3 \geq x \geq -1$
- B. $6 \leq x \leq 1$
- C. $3 \leq x \leq -1$
- D. $6 \geq x \geq 1$

Graphing and Interpreting Linear and Non-Linear Relations

1. What is the domain and range of the relation shown in the table below?

x	y
-1	-5
1	-1
3	3
5	7

Domain_____

Range_____

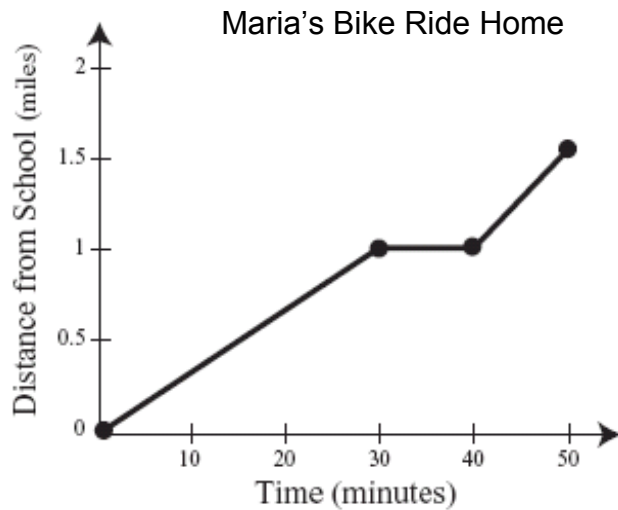
Is the relation in the table above a function?

Answer_____

2. Which relation below is NOT a function?

- A. $\{ (-2, 4), (1, 3), (0, 4) \}$
- B. $\{ (5, 5), (4, 4), (3, 3) \}$
- C. $\{ (-4, 0), (-7, 0), (11, 0) \}$
- D. $\{ (1, 4), (2, 5), (1, 7) \}$

3. Maria rode her bike home from school. The graph below shows Maria's distance from school over time.



Describe Maria's bike ride home with respect to time and distance. Be sure to include any changes in speed during the bike ride.

4. Which equation has a graph with no y-intercept?

- A. $y = 5$
- B. $x = 1$
- C. $x = y$
- D. $y = -x$

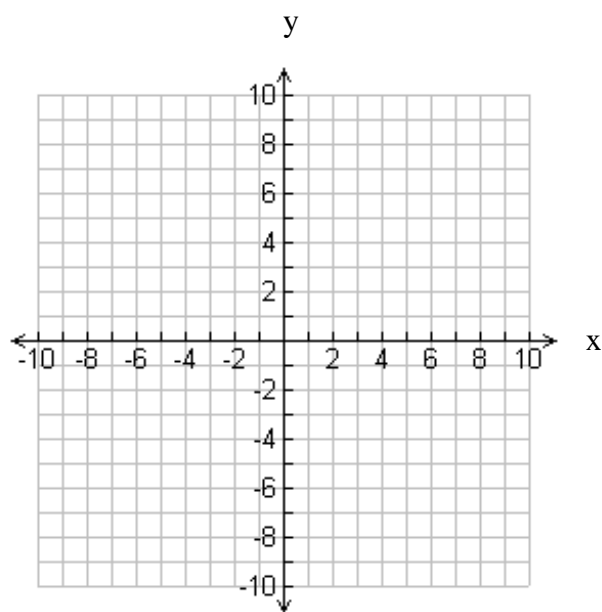
5. What is the slope, x-intercept, and y-intercept of the graph of $3x + y = 7$?

slope = _____ **x-intercept** = _____ **y-intercept** = _____

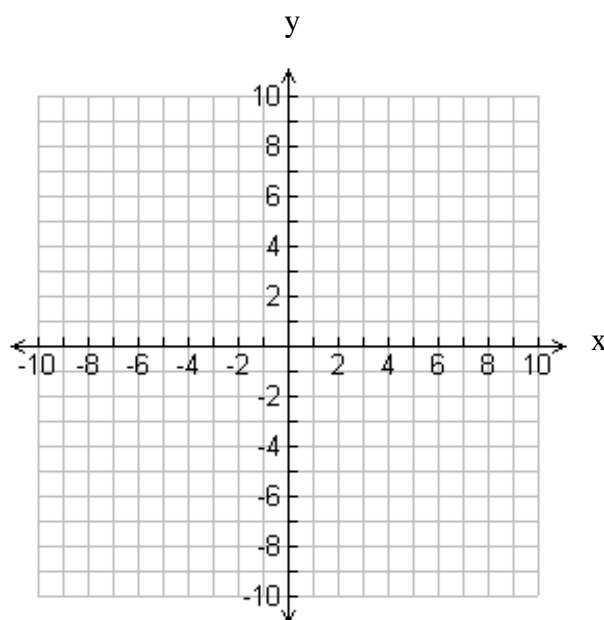
6. What is the y-intercept of the graph of $-2y = x - 4$?
- A. -4
 - B. -2
 - C. 2
 - D. 4
7. Which of the following is an equation of a line with a slope of -2 that passes through the point $(-4, 3)$?
- A. $y = -2x - 5$
 - B. $y = -2x - 4$
 - C. $y = -2x + 3$
 - D. $y = -2x + 11$
8. Write an equation of a line that passes through the points $(-2, 5)$ and $(1, 2)$.

Answer_____

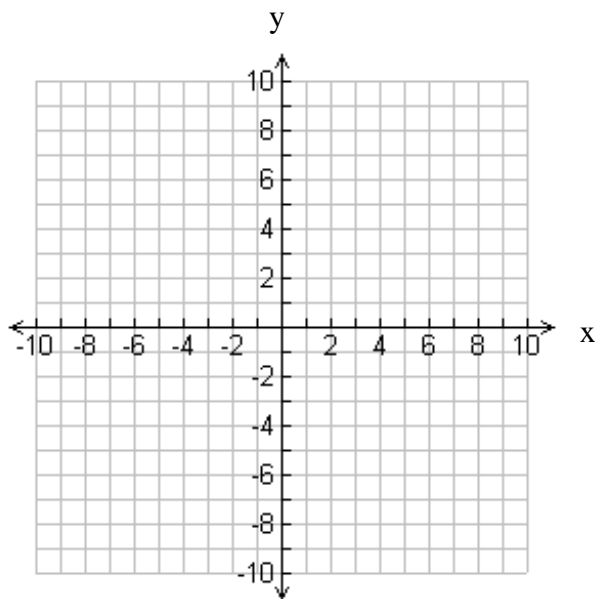
9. Graph: $y = \frac{2}{3}x - 1$



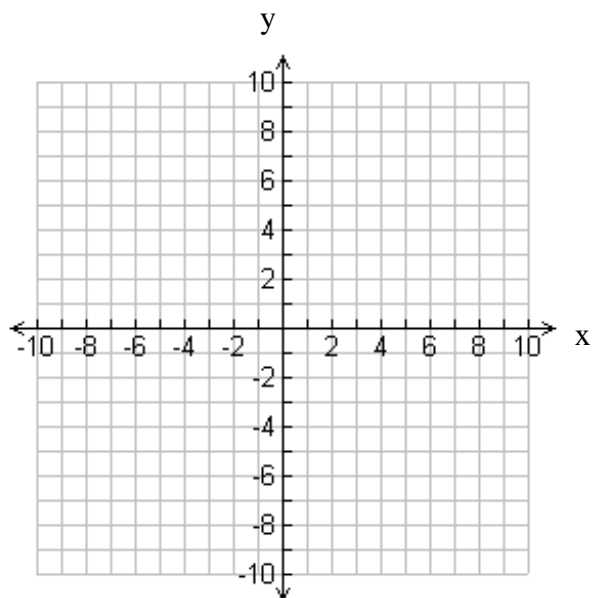
10. Graph: $6x - 2y = 10$



11. Graph: $y \leq \frac{-1}{3}x + 4$



12. Graph: $-5y < 10x$



13. Sue earns \$2 for each CD she sells and \$2.50 for each DVD she sells. Sue earned \$950 last week selling CDs and DVDs.

Write an equation to represent the number of CDs (c) and DVDs (d) Sue sold last week given that she earned \$950.

Answer_____

If Sue sold 305 CDs last week, how many DVDs did she sell?

Answer_____

14. Wes bought a pizza with 2 toppings from Bill's Pizza Place for \$11.00.
Lisa bought a pizza with 5 toppings from Bill's Pizza Place for \$14.75.

Each topping at Bill's Pizza Place costs the same amount.

What is the price per topping at Bill's Pizza Place?

Answer_____

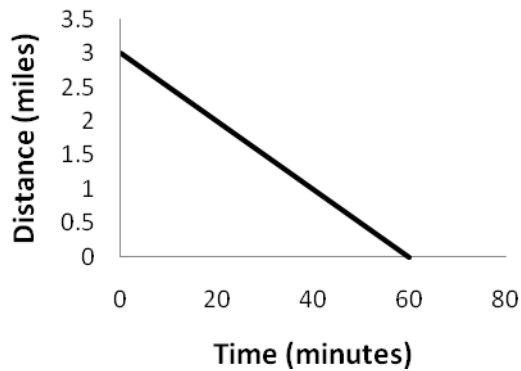
Write an equation that can be used to determine the cost (C), in dollars, of a pizza at Bill's Pizza Place given the number of toppings (T).

Answer_____

15. Joe ran from his home to school at a constant speed. He immediately turned around and ran back home, but at a slower constant speed. Joe ran along a straight path to and from school. Which graph best represents Joe's distance from his home over time?

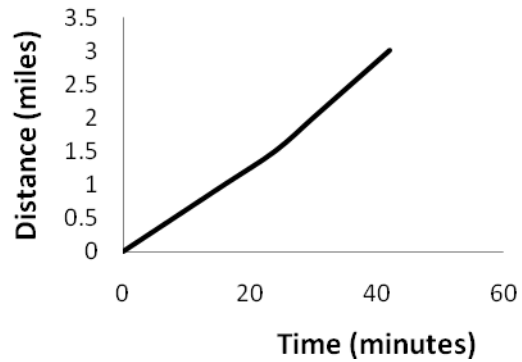
A.

Joe's Distance From Home



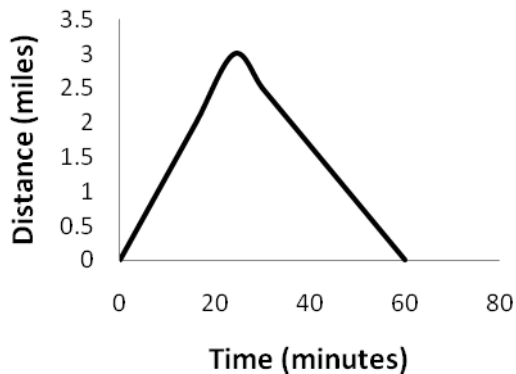
B.

Joe's Distance From Home



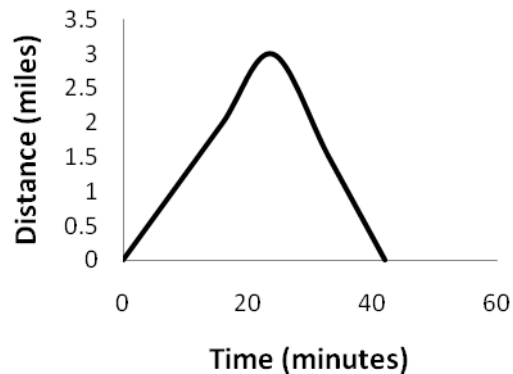
C.

Joe's Distance From Home

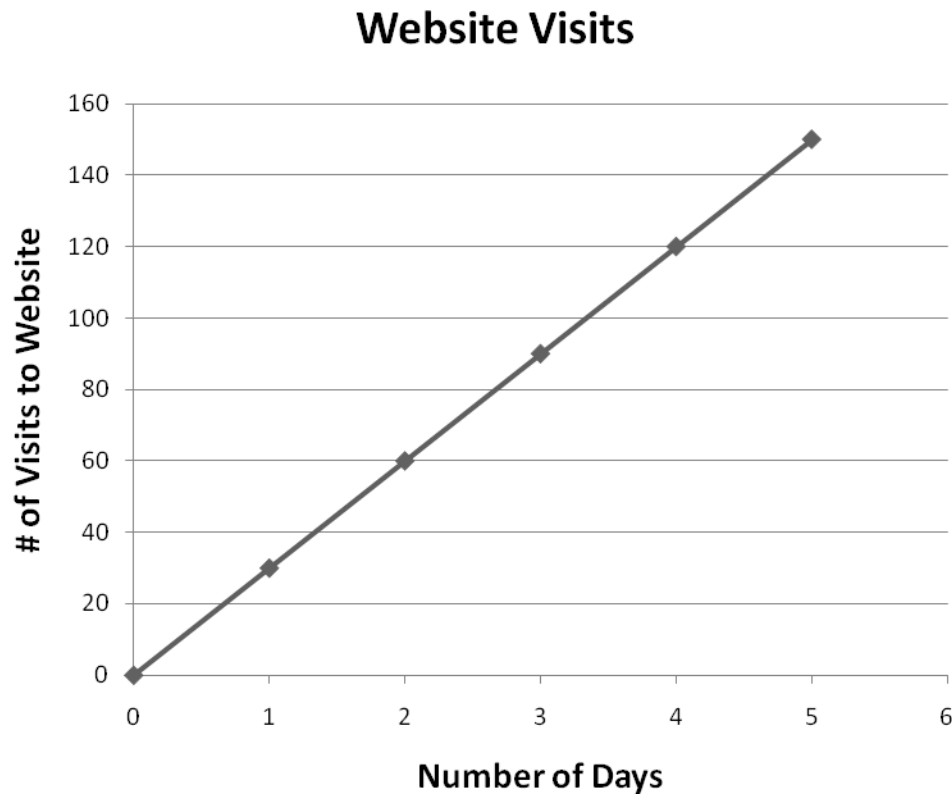


D.

Joe's Distance From Home



16. The graph below represents the total number of times a certain website was visited over a 5-day period.



What is the slope of this line segment and what does it represent in terms of this situation?

Write an equation that represents the total number of times this website is visited, V , after d days.

Answer _____

If this trend continues, how many times will this website be visited in 30 days?

Answer _____

Systems of Linear Equations and Inequalities

1. Solve the system of equations below.

$$\begin{aligned} -5y + 3x &= -16 \\ 10y + 4x &= 62 \end{aligned}$$

What is the x-value in the solution?

- A. 3
 - B. 4.6
 - C. 5
 - D. 6.6
2. Solve the system of equations below.

$$\begin{aligned} x &= -3y \\ 3y + 2x &= 3 \end{aligned}$$

What is the value of y in the solution?

- A. -3
 - B. -1
 - C. 1
 - D. 3
3. Kim bought 4 shirts and 3 pairs of jeans for \$109.85.
Jim bought 6 shirts and 1 pair of jeans for \$94.95.

Each shirt costs the same amount.

Each pair of jeans costs the same amount.

What is the cost, in dollars, for 1 pair of jeans?

Enter your answer in the response grid.

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4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
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4. Jen is 13 years younger than Andre. The sum of their ages in years is 137.

What is Andre's age in years?

Enter your answer in the response grid.

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6	6	6	6	6	6	6	6	6	6
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8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9

5. Solve the system of equations below.

$$3x - 2y = -7$$

$$-4x + y = 11$$

Answer _____

6. A group of 2 adults and 4 children paid \$95 for admission to a water park.
A different group of 3 adults and 7 children paid \$155 for admission to the same water park.

Write a system of equations that can be used to determine the admission price to the water park for an adult (A) and a child (C).

Answer _____

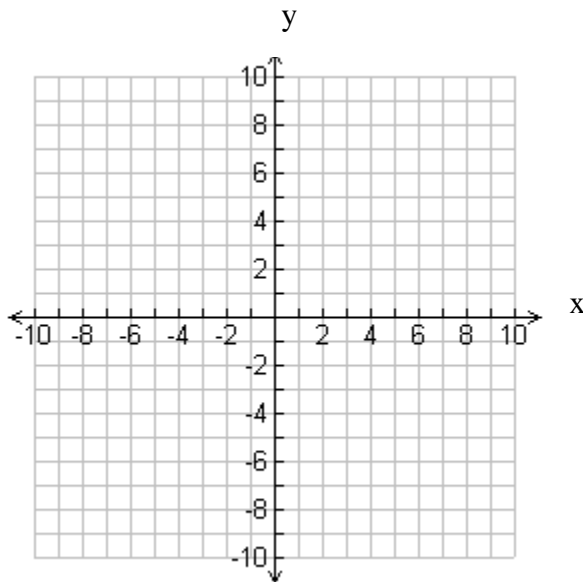
What is the admission price, in dollars, for 1 child?

Answer _____

7. Graph the system of linear inequalities below.

$$-3x + 2y > -6$$

$$-y \geq 2x - 5$$



8. Describe how to estimate the solution to a pair of equations graphed on a coordinate plane. Then, explain how to determine if there is one solution, no solution, or infinitely many solutions to the pair of equations.

Polynomials

1. Multiply: $(3x - 1)(2x + 5)$
 - A. $6x^2 + 6x - 5$
 - B. $6x^2 - 13x + 4$
 - C. $6x^2 + 13x - 5$
 - D. $6x^2 + 17x - 5$

2. Which of the following is equivalent to $(x - 4)^2$?
 - A. $x^2 - 16$
 - B. $x^2 + 16$
 - C. $x^2 - 8x - 16$
 - D. $x^2 - 8x + 16$

3. Add: $(5x^3 - 3x + 7) + (2x^3 + 6x^2 - x)$
 - A. $7x^3 + 3x^2 - x + 7$
 - B. $7x^3 - 3x^2 - x + 7$
 - C. $7x^3 + 6x^2 - 4x + 7$
 - D. $7x^3 + 6x^2 - 2x + 7$

4. Subtract: $(9x^2 + 3x - 4) - (3x^2 + 8x - 1)$
 - A. $6x^2 - 5x - 3$
 - B. $6x^2 + 5x - 5$
 - C. $6x^2 + 11x - 5$
 - D. $6x^2 - 5x - 4$

5. What is the greatest common factor of the expression below?

$$24a^6b^2 - 18a^3b + 12a^2b^3$$

- A. $2ab$
 - B. $2a^3b^2$
 - C. $6a^2b$
 - D. $6a^6b^3$
6. Divide: $(18m^5p^4 + 36m^7p^3 - 4m^3p)$ by $(2m^3p)$

- A. $9m^2p^3 + 18m^4p^2 - 2$
- B. $12m^2p^3 + 34m^4p^2 - 2$
- C. $9m^2p^3 + 18m^4p^2 - 2mp$
- D. $12m^2p^3 + 34m^4p^2 - 2mp$

7. Which is equivalent to $3x^2 \cdot 2x^4$?

- A. $5x^6$
- B. $5x^8$
- C. $6x^6$
- D. $6x^8$

8. Which expression is equivalent to $(g^6h^3)^3$?

- A. g^9h^6
- B. g^9h^9
- C. $g^{18}h^6$
- D. $g^{18}h^9$

9. The volume (V) of a right circular cone can be found using the formula

$$V = \frac{1}{3}\pi \cdot r^2h, \text{ where } r \text{ is the radius and } h \text{ is the height.}$$

Which equation represents the volume of a right circular cone with a radius of $6x$ and a height of 5 ?

- A. $V = 20\pi \cdot x$
- B. $V = 20\pi \cdot x^2$
- C. $V = 60\pi \cdot x$
- D. $V = 60\pi \cdot x^2$

10. Simplify: $\frac{15m^7c^6}{3mc^2}$

- A. $5m^6c^3$
- B. $5m^6c^4$
- C. $5m^7c^4$
- D. $12m^6c^4$

11. Factor: $4x^2 - 1$

Answer _____

12. Factor: $x^2 - 3x - 28$

Answer _____

13. Simplify: $\sqrt{252}$

- A. $6\sqrt{7}$
- B. $7\sqrt{6}$
- C. $7\sqrt{36}$
- D. $36\sqrt{7}$

14. Simplify: $-3m - \frac{1}{5}(50m + 100) - 1$

- A. $-48m - 1$
- B. $-13m + 19$
- C. $-13m - 21$
- D. $-13m - 2$

15. Simplify: $\sqrt{9d^{100}}$

- A. $4.5d^{50}$
- B. $3d^{50}$
- C. $4.5d^{10}$
- D. $3d^{10}$

16. Factor: $6x^2 - x - 15$

- A. $(2x + 3)(3x - 5)$
- B. $(6x + 5)(x - 3)$
- C. $(6x + 1)(x - 15)$
- D. $(2x - 3)(3x + 5)$

Solving and Graphing Quadratic Equations

1. Solve: $x^2 = -x + 30$

- A. $x = -6, -5$
- B. $x = -6, 5$
- C. $x = -5, 6$
- D. $x = 5, 6$

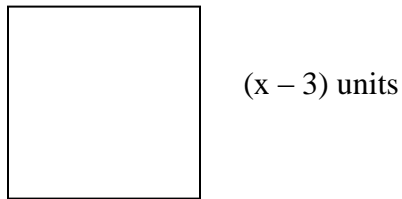
2. Solve: $(x + 3)^2 = 36$

- A. $x = 3$
- B. $x = 9$
- C. $x = -9, 3$
- D. $x = 3, 9$

3. Solve: $2x^2 - 4x - 3 = 0$

- A. $x = 1 \pm 2\sqrt{10}$
- B. $x = 2 \pm \sqrt{10}$
- C. $x = \frac{2 \pm \sqrt{10}}{2}$
- D. $x = \frac{2 \pm \sqrt{2}}{2}$

4. Consider the square below.



What is the value of x if the area of the square is 126.5625 square units?

- A. 8.25
 - B. 11.25
 - C. 14.25
 - D. 17.25
5. The graph of which function has x -intercepts $(-4, 0)$ and $(7, 0)$?
- A. $y = (x - 4)(x + 7)$
 - B. $y = (x + 4)(x - 7)$
 - C. $y = (x + 4)(x + 7)$
 - D. $y = (x - 4)(x - 7)$
6. What are the zeros of the function $y = x^2 - x - 20$?
- A. -5 and -4
 - B. -5 and 4
 - C. -4 and 5
 - D. 4 and 5
7. What are the x -intercepts of the graph of $y = 2x^2 + x - 10$?
- A. $(-5, 0)$ and $(2, 0)$
 - B. $(-2, 0)$ and $(5, 0)$
 - C. $(-2, 0)$ and $(2.5, 0)$
 - D. $(2, 0)$ and $(-2.5, 0)$

8. What is the solution of $x^2 - 16x = -64$?

Enter your answer in the response grid.

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4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9

9. The height (h) of a stone, in meters, thrown into the air can be modeled by the equation $h = -4.9t^2 + 20t + 10$, where t represents time in seconds.

How many seconds will it take for the stone to hit the ground ($h = 0$) after it is thrown into the air? Round your answer to the tenths place.

Enter your answer in the response grid.

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6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9

10. A rectangular dance floor measures 24 feet by 32 feet. The length and width of the floor will both be increased by x feet.

Write an equation that can be used to determine the value of x , in feet, if the area of the new dance floor is 1,174.25 square feet.

Answer_____

What are the dimensions of the new dance floor, in feet, if the area is 1,174.25 square feet?

Answer_____

What is the perimeter of the new dance floor, in feet, if the area is 1,174.25 square feet?

Answer_____

11. Solve $\sqrt{2x+3} = x$.

- A. $x = -3$
- B. $x = 1$
- C. $x = 3$
- D. $x = -1, 3$

12. The height (h) of a certain insect, in feet, that jumps straight up into the air is modeled by the equation $h = -16t^2 + vt$, where t is the time in seconds after the insect jumps, and v is the initial upward velocity of the insect.

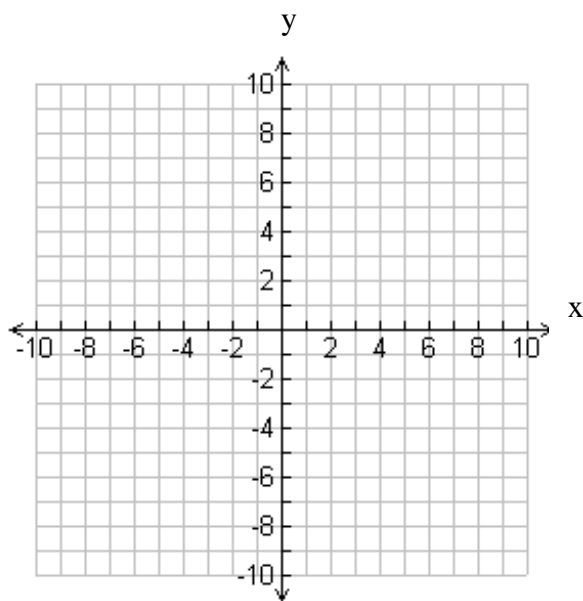
Write an equation that can be used to find the height (h) of the insect, in feet, after t seconds, if the insect's initial upward velocity is 4 feet per second.

Answer_____

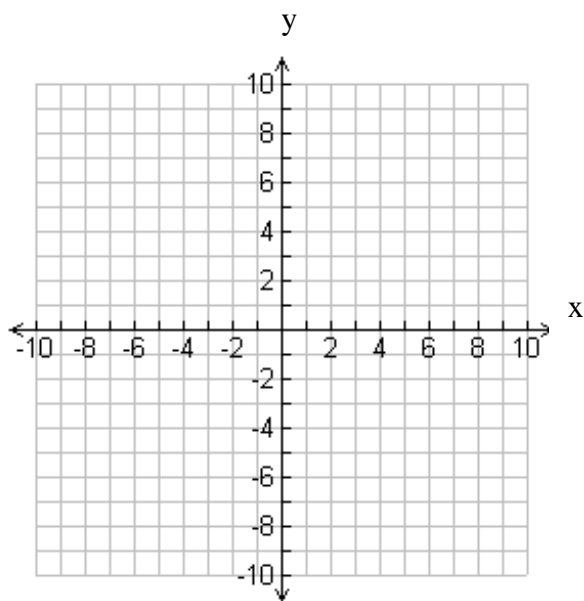
How long, in seconds, will it take for the insect to hit the ground after it jumps?

Answer_____

13. Graph $y = x^2 + 4x - 3$.



14. Graph $y = -2x^2 + 8x$.



Answer Key

Solving Linear Equations and Inequalities

1. A
2. A
3. C
4. A
5. D
6. $4.5c \leq 75$ and 16
7. -1
8. 5
9. D
10. In step 2, the equation should read $8x = -2$. When combining like terms, $3x$ was subtracted from $5x$ instead of adding $3x$ to both sides of the equation. (Or other valid explanation.)
$$x = -\frac{1}{4}$$
11. $300 + 15b \geq 500$ and 14
12. $12T > 6.5T + 150$ and 28
13. D

Graphing and Interpreting Linear and Non-Linear Relations

1. Domain: -1, 1, 3, 5
Range: -5, -1, 3, 7
Yes
2. D
3. Maria rode her bike at a constant speed for the first 30 minutes. Then, she rested for 10 minutes. Finally, Maria rode at a constant speed for 10 more minutes, but at a faster pace than before.
4. B
5. slope = -3, x-int. = $\frac{7}{3}$, y-int. = 7
6. C
7. A
8. $y = -x + 3$
9. The graph of $y = \frac{2}{3}x - 1$. The line contains the y-intercept of -1. Other points contained in the line are (3, 1) and (-3, -3).
10. The graph of $6x - 2y = 10$. The line contains the y-intercept of -5. Other points contained in the line are (1, -2), (-1, -8), and ($\frac{5}{3}$, 0).

11. The graph of $y \leq \frac{-1}{3}x + 4$. A solid line with a y-intercept of 4 should be graphed.

Other points contained in the line are (3, 3) and (-3, 5). The solution (shading) is below the line $y = \frac{-1}{3}x + 4$.

12. The graph of $-5y < 10x$ ($y > -2x$). A dashed line with a y-intercept of 0 should be graphed. Other points contained in the line are (1, -2) and (-1, 2). The solution (shading) is above the dashed line $y = -2x$.

13. $2c + 2.5d = 950$ and 136

14. \$1.25 and $C = 8.5 + 1.25T$

15. C

16. 30; the slope represents that this website is visited 30 times each day; $V = 30d$; 900

Systems of Linear Equations and Inequalities

1. A

2. B

3. 19.95

4. 75

5. (-3, -1)

6. $2A + 4C = 95$

$3A + 7C = 155$

\$12.50

7. The graph of $-3x + 2y > -6$ (Slope Int. Form: $y > \frac{3}{2}x - 3$). Shading should be above the dashed line.

The graph of $-y \geq 2x - 5$ (Slope Int. Form: $y \leq -2x + 5$). Shading should be below the solid line.

The solution set is the intersection of the graphs (overlapping shaded region).

8. Estimate the point of intersection of the graphed lines. If the lines intersect in exactly one point, then there is one solution to the system of equations. If the lines are parallel (they do not intersect), then there is no solution. If the pair of equation produce the same line when graphed, then there are infinitely many solutions.

Polynomials

1. C
2. D
3. C
4. A
5. C
6. A
7. C
8. D
9. D
10. B
11. $(2x - 1)(2x + 1)$
12. $(x - 7)(x + 4)$
13. A
14. C
15. B
16. A

Solving and Graphing Quadratic Equations

1. B
2. C
3. C
4. C
5. B
6. C
7. D
8. 8
9. 4.5 or $9/2$ (**NOT $4\frac{1}{2}$ -- Mixed #'s are not allowed on gridded response items.**)
10. $(x + 24)(x + 32) = 1,174.25$ and 30.5 feet by 38.5 feet and 138 feet
11. C
12. $h = -16t^2 + 4t$ and $\frac{1}{4}$
13. The graph of $y = x^2 + 4x - 3$: Vertex at $(-2, -7)$. Parabola passing through $(-2, -7)$, $(0, -3)$, $(-4, -3)$, and/or other points contained in the graph of $y = x^2 + 4x - 3$.
14. The graph of $y = -2x^2 + 8x$: Vertex at $(2, 8)$. Parabola passing through $(2, 8)$, $(0, 0)$, $(4, 0)$, and/or other points contained in the graph of $y = -2x^2 + 8x$.